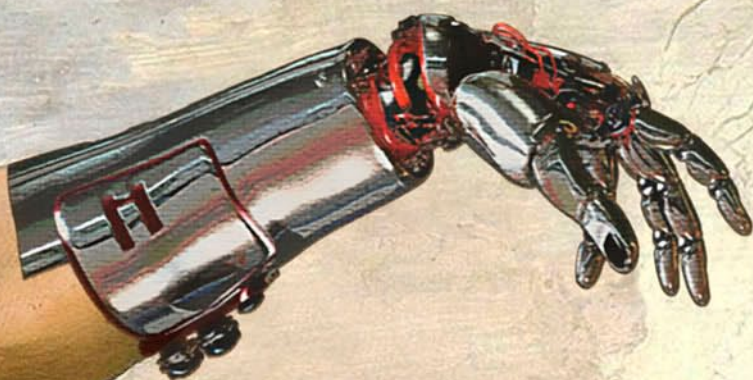




# Guru

ISSUE 17 ■ APRIL/MAY 2014



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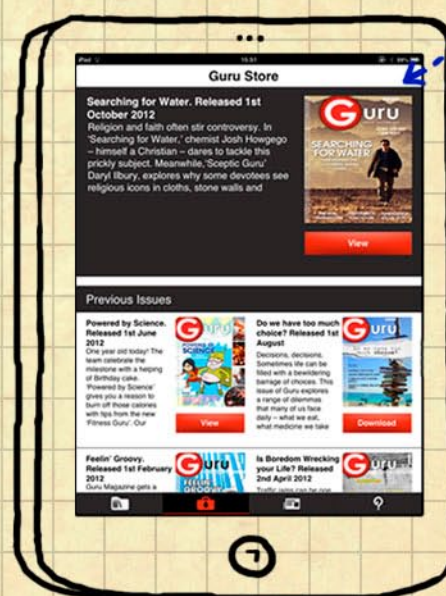
HOW TECHNOLOGY IS  
BECOMING A PART OF US

**PLUS...**

SOCIAL MEDIA BITES BACK  
TRASH PERSONALITY TESTS  
WHAT WEARABLE TECH (NOT) TO WEAR



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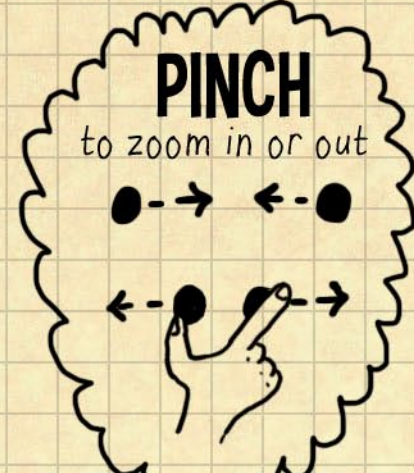
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come: I've made my conclusion; but for now, until you're able to read my mind, I'm keeping it to myself.



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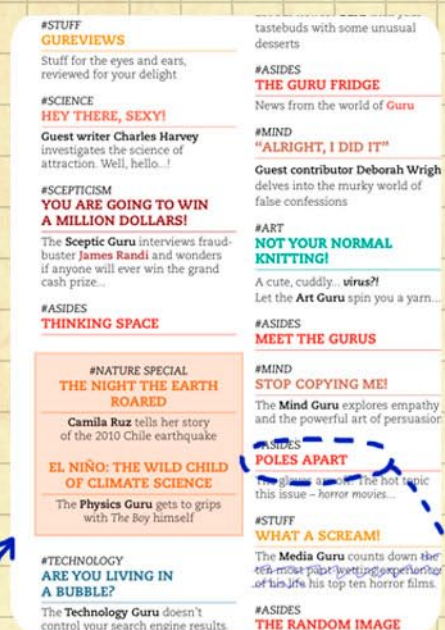
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## The original research

- Nishimoto, S.; Vu, A.; Naselaris, T.; Benjamini, Y.; Yu, B.; Gallant, J. (2011)

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## CONTENTS PAGE

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of how the brain of an individual sees the world. This advance may represent an Orwellian nightmare to some, but no one can deny these groundbreaking developments aren't fascinating. The researchers used themselves as the test subjects and started their experiment by



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### DITCH THE PERSONALITY QUIZZES

When the Guru team took the 'Friends Personality Test', Nature Guru Autumn Sartain turned out to be most like Rachel. Surprisingly, Deputy Editor Ross is a bit of a Phoebe. Columnist Leila Wildsmith gives her take on whether we should bother with personality tests at all. (She's such a Chandler...)

## #TECHNOLOGY

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### BUILDING A BETTER YOU

Technology offers you a chance to be you – the real you – or so says guest writer Christopher Phillips. He thinks that fusing us with the best bits of technology will give us a longer life, a stronger body and better mind. But will it make you a better person?

## #NATURE

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If Twitter had been around when Steven Spielberg was making *Jaws* then it wouldn't have been half as exciting. The power of Twitter is starting to bite back at those deadly sharks, as Nature Guru Autumn Sartain explains.

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### ANGELINA JOLIE WAS JUST THE START

No, this is nothing to do with a woman jumping around a cave, shooting villains while wearing an impracticably tight vest. Janske Nel talks about how people like Angelina are making brave decisions about their future health based on their genetics. Welcome to the new era of personalised medicine.

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### YOU CAN'T GO OUT IN THAT! A RUNDOWN OF TOMORROW'S WEARABLE TECH

Got your mobile phone and keys? Yep! Got your wallet? Check! Digi-specs, smartwatch, and sweat-activated, illuminated sweater? Err... Wearable technology is soon to become a bigger part of our lives. Here's a rundown of four emerging technologies with our 'whether you should really wear it' score.

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### WHAT'S THE TIME, MR WOLF?

It's cheaper than a Rolex and doesn't need winding up. It's your internal clock – your very own way of telling the time. Complexity Guru Ross Harper insists that keeping your clock in sync is essential for healthy living, yet is surprisingly difficult to do in the modern world.

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### SOLOMON TABLE – IPAD APP

Decisions, decisions. If it's not deciding where to go travelling then it's what to cook for dinner. A new app, *Solomon Table*, promises to make all of life's dilemmas easy to resolve. To help you decide if it's worth buying, we've given you two conflicting reviews. We're so witty.

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Got a question? We all have. Especially the ones we were too embarrassed to ask the parents. This issue we felt it our duty to publish one of our most risqué and entertaining answers so far. No need to thank us.

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### COMMUTING: DOES IT HAVE TO BE A BURDEN?

It's easy to hate overly cheerful people. Media Guru Ben Veal insists his newfound joy of the daily commute is for everyone – he honestly believes you'll be cheering at the tailback! Check out his four top tips for finding delight during the daily grind. You won't hate him for it.

## #DEPARTURE LOUNGE

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## ARRIVALS LOUNGE



If you think you're a pretty connected person then you've clearly not heard of Chris Dancy. The former IT worker is now the world's most 'wired' person, having up to 700 computers tracking him at any given moment. If there's a wearable gadget, then he's wearing it. He is adorned with a pair of Google Glasses; a Memoto camera, which takes a photo every thirty seconds; a Pebble smartwatch; two smartphones; a Fitbit Flex movement and sleep sensor; a heart rate monitor; a posture monitor to stop him slouching and... well, you get the idea.

Most of us don't share Chris' wholesale acceptance of 'life-enhancing' gizmos. But it's almost inevitable that we all face a more intimate relationship with the silicon chip in the years ahead. This, our seventeenth issue, takes a special look at how technology is becoming an ever closer part of us. (Or perhaps how we are becoming a part of our technology.) This is an exciting time, or so says Hawaiian writer Christopher Phillips, who gives an upbeat look at a tech-integrated future in 'Building a Better You?', on

**page 10.** **Page 13** sees Nature Guru Autumn Sartain explain how social media is helping keep surfers safe from shark attacks, while on **page 22** we give a run-down of four types of wearable tech that are perhaps not worth looking forward to.

But that's not all. Janske Nel explores the promise of better healthcare ('Angelina Jolie was just the start' on **page 18**), while we also discover some pretty offbeat musical creations ('5 ways to make funky tunes', **page 30**). Media Guru Ben Veal rounds off the show with a decidedly light-hearted look at how to make the long morning commute more bearable.

This will be the last issue of *Guru Magazine* in its present form. But fear not! We'll be back! Next time, *Guru* will be coming to you in a wholly redesigned format that will be more readable, more frequent and just as beautiful as ever. (Read more on **page 7**.)

While *Guru* enters its new season of change, remember to stay connected with us via **Twitter**, **Facebook** and **Google+**. Personal tracking devices not required.

*Dr. Stu*

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## GURU NEWS

ANNOUNCEMENT:  
GURU MAGAZINE IS ABOUT  
TO CHANGE – FOR GOOD.

Cripes! Has it really been three years already? Yes, that's right: *Guru Magazine* has been going longer than many a celebrity marriage. As we reach our third anniversary, we've decided that it's time to freshen things up a little – so we're trying something new. Again.

## Guru Magazine: reimagined

When we first set up shop (so to speak), we were doing something pretty new. In May 2011, we launched *Guru* as a paper-free, digital magazine that covered science-themed stuff in a way that was understandable and accessible. Not long after, we released it in e-Reader and Kindle formats. And in March 2013, a cross-platform mobile app was released, making it even easier to dive into each issue.

But now we want to use the latest technology to make your enjoyment of *Guru* even slicker and simpler. All future *Guru* articles will be released in an online format, without the big download. It won't be a bi-monthly issue like you're used to, but individual articles will be released on a more regular basis. You will be able to read the new-look *Guru* on any device in a format that makes it look top-notch on whatever size of

screen you're reading it – which means no more pinching and zooming on your smartphone. Sharing, bookmarking and searching articles will also be much easier.

We think that the new *Guru* will be beautiful: the things you've grown to know and love about *Guru* over the last three years, served up in a shiny new way.

There is one downside, however: our transition to newer technologies will take a little time – time during which we'll need to be focusing on things behind the scenes, rather than putting together the next couple of issues. But don't shed a tear: 'Ask a Guru' will be continuing as usual and we'll be putting fresh content on our website. We'll also be keeping you entertained with our witty one-liners on twitter and Facebook. Plus, if you ask us really nicely, we'll even start an Instagram photo collection of the ever-growing pile of empty coffee cups. And everything will still be free for all to enjoy.

Keep an eye on our website, our **Facebook page**, and our **twitter feed** for the latest updates on *Guru* 2.0. We'll be back in the blink of an eye!







# Ditch the personality quizzes: they diminish you.

Is it just me, or have you noticed the recent increase in the number of quizzes available online? One that has been doing the rounds on Facebook is the test that reveals the famous personality you are most like. With just a few simple questions, you can discover your secret rock god or movie star identity.

While I'm sure not many of us take these personality tests seriously – I don't *really* bear much resemblance to an espresso, as one such quiz suggested – their seeming popularity suggests a cultural and generational identity crisis. In the past, without quizzes or tests to determine personality, people were forced to look inside themselves – or to their family, friends or job – for their identity. They may not have liked what they found, but at least they knew who they were. But our media-driven world exposes us to an increasingly endless array of personalities, which can leave us increasingly unaware of who we *really* are.

Kendra Cherry, author of *The Everything Psychology Book*, asserts that "In today's rapidly changing world, identity crises are more common". According to her, many of us are asking, as Shakespeare's tragic hero King Lear did, "Who is it that

can tell me who I am?"

An identity crisis isn't always a bad thing though. The word 'crisis' has its roots in the Greek word for 'decision' and suggests a significant turning point or a decisive moment. We all have defining moments – points that in some way affect our identity. In addition, assessing ourselves and trying to define who we are is an essential part of human development. Professor Susan Krauss Whitbourne writes in her online article '*Are you having an identity crisis?*' that "an identity 'crisis' may occur any time [when] you're faced with a challenge to your sense of self." Furthermore, the famous developmental psychologist, Erik Erikson, believed crises to be perfectly normal. He defined *several stages* of 'crisis' that occur in life, including a '*Who am I?*' conflict in adolescence, and the question of '*Will I be loved or will I be alone?*' in young adulthood.

Taking time to evaluate our values, our likes and dislikes, our skills and our beliefs is an important process. But it can become a problem when quizzes and tests offer us an opportunity to assess ourselves on a daily basis. Of course, we don't have to partake in any of them, but when everyone else seems to be doing it, it becomes irresistible. And in measuring ourselves in this way, it can be all too easy to lose our sense of self. Importantly, it seems that the *actual* identity to which we commit to is

## 5 hilariously useless personality tests

**The celebrity similarity test:** find out which of over 100 fictional characters you are most like.

Give your ego a boost by discovering which real life personality you have the same personality as at [celebritytypes.com](http://celebritytypes.com)

You really are nothing at all like a spoon. But if you thought you might be, **then this test will tell you which inanimate object you are most similar to.** Or not.

So you like coffee, huh? But what if you WERE a cup of coffee? **Find out if you're an espresso or cappuccino here.**

**The unofficial Friends TV character personality test.** It will probably tell you nothing useful.

not as significant as the *act of committing*: Cherry writes, "Researchers have found that those who have made a strong commitment to an identity tend to be happier and healthier than those who have not."

I have taken several of these quizzes (strictly for research purposes, of course). Whilst I am pleased to discover that I have an affinity with one of my childhood heroines – Disney's Little Mermaid, Ariel – I was less than excited by the results of one *Downton Abbey* character quiz that revealed I am most like the "jealous, overlooked" middle sister, Edith. Neither am I delighted by the *Friends* character quiz, which told me that I am most like a man.

The problem with these quizzes is that they don't affirm our true identity: even the results that I'm pleased with are disappointing in as far as I don't believe them to be real. While I might see some

similarities to my own personality, I don't feel as though I fully live up to the character description. What's more, the quiz results never fully capture who I am. And how could they? I've only answered a handful of questions – and many of these require choosing the best answer out of a bad bunch.

**Shakespeare's personality test: chasing your shadow**

Perhaps Shakespeare shows us something when the only response Lear gets to his question about his identity is "Lear's shadow." Shakespeare realised what we sometimes fail to see: that asking other people to define us actually diminishes us – we become shadows of our real selves. Ten questions on a website that take me less than ten minutes to answer can no more tell me who I am than the stranger I've made polite small talk with for a ten-minute train journey.

In our technologically-driven pursuit of ourselves, we dilute our true identities. Psychologist Mel Schwartz captures this perfectly when he *writes*, "The irony is that the more you seek to identify who you *are*, the more fragile you are likely to feel about yourself".

He continues,

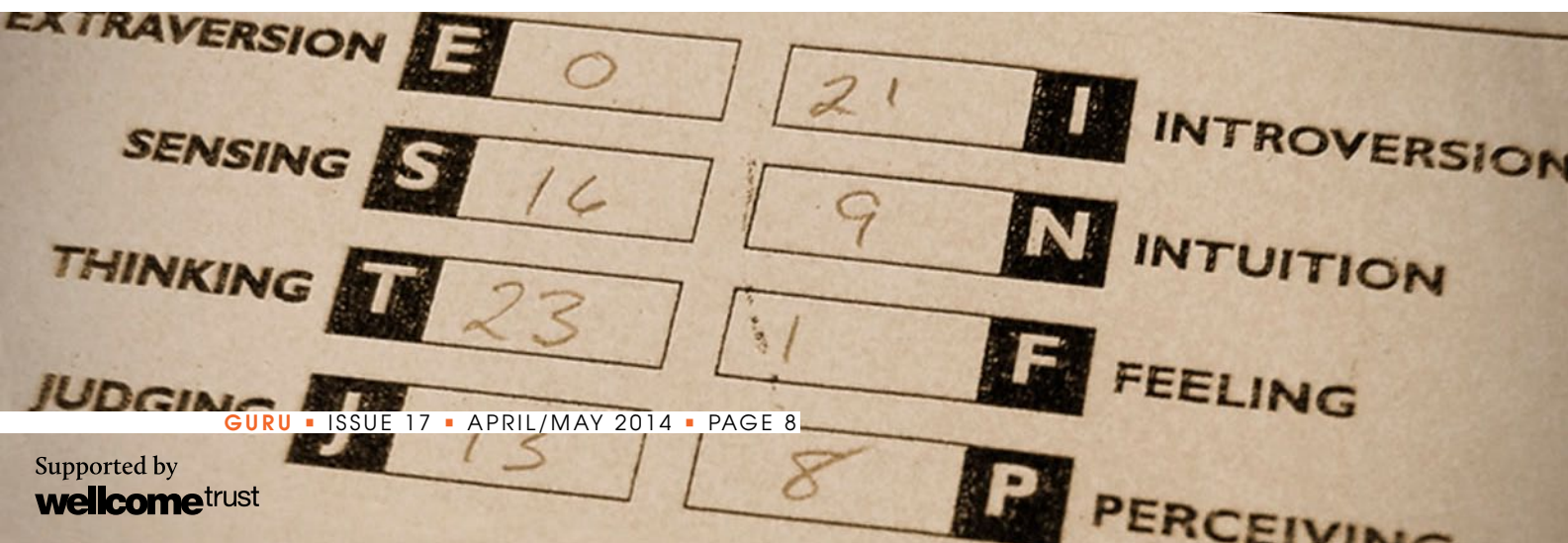
"Our identity should be seen as an ongoing process. Rather than a static snapshot, we should embrace a flowing sense of self, whereby we are perpetually re-framing, re-organising, re-thinking and re-considering ourselves. How different would life be if rather than asking "who am I?", we contemplated how we'd like to engage life?"

In asking the question "who am I?" we frustrate ourselves by trying to condense our whole nature and existence into a single phrase. It is far better to understand that our sense of self is *not* a fixed identity that is ripe for definition by different quizzes, but is something that evolves and develops over time and, with different experiences, allows us to feel comfortable with the process of self-discovery.

Or as Krauss Whitbourne says, "It's healthy to keep exploring your values, roles, and sense of self regardless of your age".

However you choose to do this, don't start on Facebook.

**Leila Wildsmith** is an English teacher in a secondary school and, in her spare time, loves writing and reading a wide variety of different books. She also intensely dislikes misplaced apostrophe's.





# BUILDING A BETTER YOU?



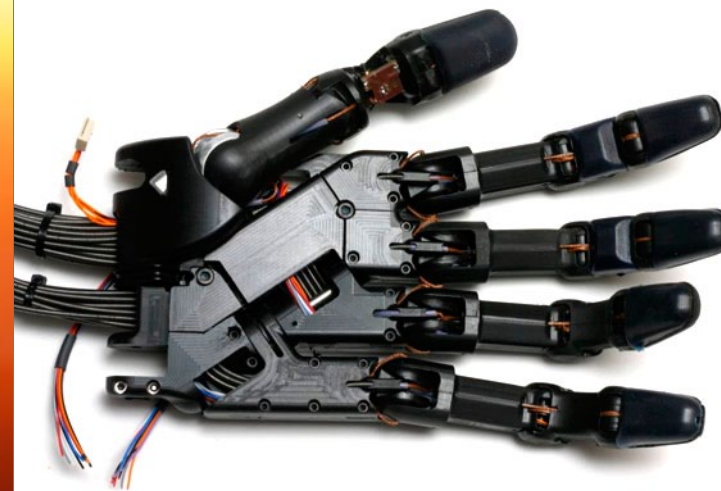
CHRISTOPHER PHILLIPS

Welcome to the future. You are now living in an era of trans-human technology – an era some call an evolutionary renaissance. And you are what we call a cyborg: part human, part machine...

For decades we have been integrating technology into our daily lives. Every person has become a mass consumer and mass producer of data. We engage with technology to the point that every waking moment is dominated by interactions with microchips. Our society has embraced technology willingly and we have integrated technology into every facet of our daily lives: the way we conduct business, engage in discourse, wage war and stage revolutions; the ways we organise social gatherings, share intimate moments and fall in love. Technology has now become the means for all of these things that make us human. Welcome to the future. Welcome to now.

Right now, many of you may be reading this article on a mobile device – a device that, if you're honest, never leaves your side. Your touchscreen companion is millimeters from your skin from the moment you wake to when you go to sleep. You may not have realized it, but technology has never before been so intimately woven into our lives.

Technology has allowed us to improve ourselves, our interactions and activities. The manner in which we produce art, science, literature; the way we communicate and educate; our sharing of ideas and experiences; even our interactions with our environment – all of this has been redefined by the integration of technology into our society. Take, for example, the act of reading, that most 'human' of activities. It is now performed by billions of people globally



## BUILDING A BETTER YOU?

via a digital medium, a technology that didn't exist a generation ago. These digital pages exist as machine code: virtual and intangible. Yet the information they convey is as real and as meaningful as that conveyed by ink on a page. You can share this information at the speed of light with any other human on the planet, to entire populations if you so desire.

### Got a spare leg, anyone?

We are all participants in this technological renaissance and – like it or not – our nature as human beings is fundamentally changing. The next twenty years will see the relationship between human and machine redefined in a most profound way. This generation could be part of a radical evolutionary change in life, the like of which hasn't been seen since our ancestors crawled from the oceans millions of years ago.

It may sound frightening, but I am excited.

We draw ourselves ever closer to our technology because we want to better ourselves – to make our life somehow easier and more enjoyable. Of course, this is not a new concept: humanity has always sought to do this, albeit through the use of simpler technology. Take the fashioning of basic tools by early humans, for example: axes, spears, spades and knives allowed frail humans to overcome biological limitations. Tools allowed us to hunt bigger game, to farm the land and construct dwellings.

With robotics and genetics we will once again change ourselves. Advancements in nanotechnology, mechanical prostheses, computational processing power and material science have already enabled us to create sophisticated limbs that assist those that have suffered the loss of their original limbs. Some of today's most advanced prosthesis are now even able to restore limited sensation to the wearer. For the first time, amputees are starting to be able to feel again, enabling them to perform complex mobility tasks, such as climbing stairs under one's own power. Similar development are at work in helping blind people to see again, by bridging damaged optic nerves with computer chips that actually relay visual information to the brain. Advancements in technology have also helped to restore hearing, replace damaged organs and restore nervous system functions. We are starting to heal and restore like we could have only previously imagined.





## BUILDING A BETTER YOU?

### See the world... through Google's eyes

'Augmented reality' is a rapidly advancing technology that is set to alter the way we view the world around us as we use glasses and visual displays to superimpose digital images into our visual space.

The military and emergency services have used 'augmented reality' technology for many years. Heads-up-displays (HUD) in helmets and glasses present situational data, such as environmental conditions, navigational data, and hazards, to a user wherever they are.

Google Glass is one of the first attempts at an augmented reality product intended for the general consumer. But more than showing you the way to the Post Office, it offers the ability to record via a digital camera and microphone. Google's digital specs are a first step, but imagine if your eye itself could perform the same functions. What if you had an enhanced eye that was able to display and gather data about your world? What if that eye looked, felt, and acted like a regular human eye, but possessed advanced capabilities? It is but a technological stone's throw away.



We could extrapolate these capabilities to other aspects of the human body. What if a combination of genetic engineering and prosthetic technologies enabled us to produce artificial limbs that resembled our own limbs in every detail, but with enhanced capabilities, such as extra strength and speed, and resilience to trauma and disease?

Would you consider replacing one of your limbs with an advanced prosthesis, knowing that it was no different from the limb you were born with – except, it was better? Or consider augmenting your brain and other internal organs so that they function with greater efficiency and are more resistant to disease and failure. Would you? Or perhaps, more importantly, what would stop you?

And that is the crunch question. While this may all sound like science fiction at the moment, these prospects are becoming very real; over the next decade or two we will see advancements in technology that will allow us to enhance ourselves in ways we have only dreamed of. The human body is, after all, but a biological machine. It undergoes mechanical failure and degradation just like any device. With sufficiently advanced technology, we can overcome these flaws in our biological construction to prolong its use indefinitely.

Some people will see this future as daunting and bleak, but I see it as one of hope. The idea of closely integrating technology into our bodies and minds will have profound implications to society – but the path is set. Your smartphone, tablet, headset, pacemaker or prosthesis are the first iterations of this union of humans and technology. We have already chosen to embrace this technology and, for the most part, have used it responsibly.

Yes, there are risks and some will always misuse any technology for personal gain. (Take piracy and privacy invasions, for example.) But being aware of these risks will help us to minimise the dangers.

It's an exciting future: I believe that we as a species will ultimately apply this technology responsibly, just as we have throughout history. New technology will redefine society and create one that is more democratic, equal and just – in which *every* human being has the opportunity to fulfil their potential, regardless of physical or mental disposition.

In the end, combining humanity with technology will help us all to become more human.

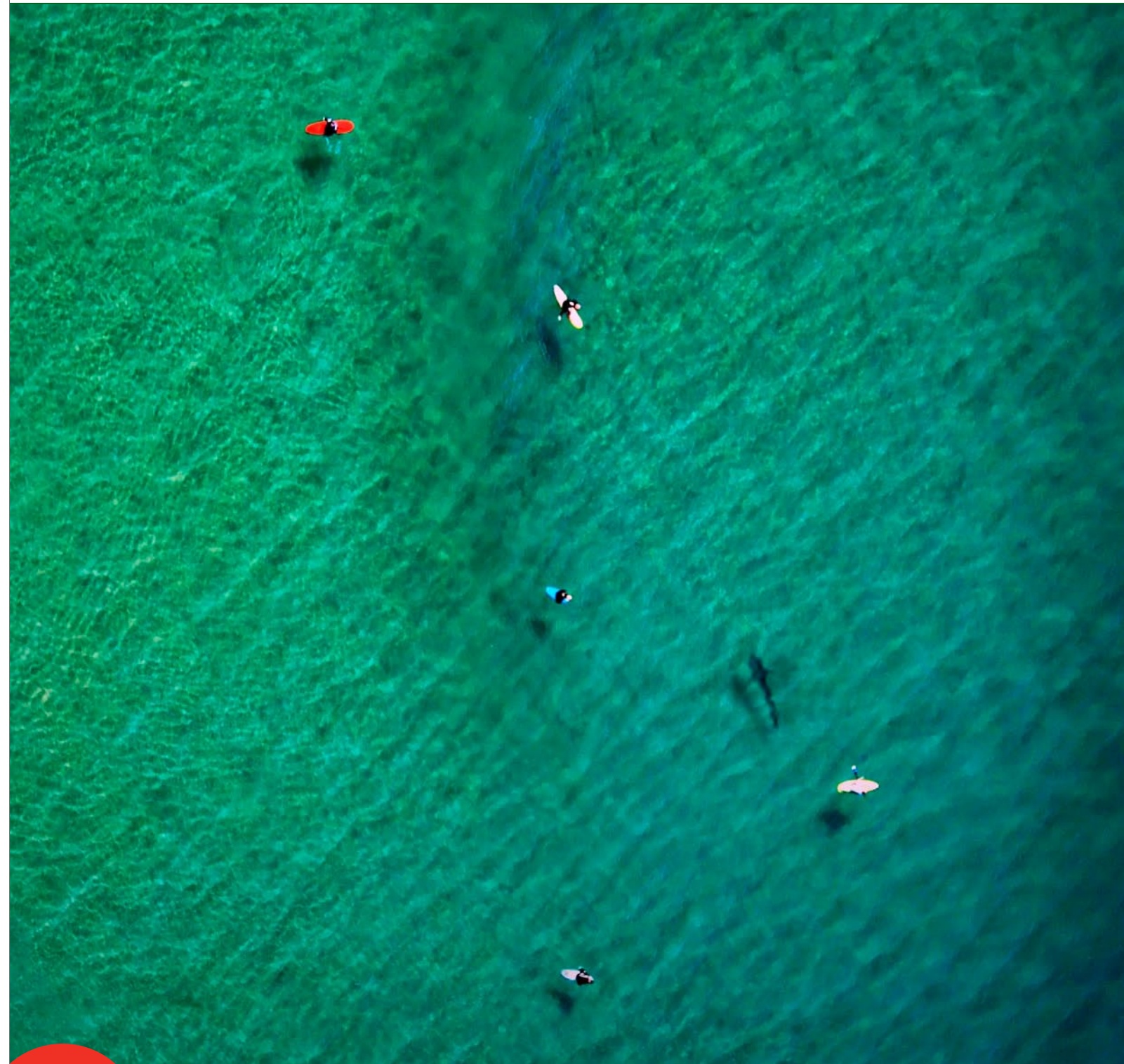


**Christopher Phillips** is currently based at 'Imiloa Astronomy Center of Hawai'i in the Hawaiian Islands. He is involved in science, education and science communication projects in the UK, Europe, Asia and the Middle East. He is a Physics and Astronomy graduate and lives on the summit of one of Earth's most active volcanos, Kilauea, with his fiancée, Melissa and their cat, Sprout.

#NATURE

# #SURFERSFORINNER

TWEETING SHARKS WARN BEACHGOERS THEY'RE NEAR



AUTUMN SARTAIN ■ NATURE GURU



## #SURFERSFORDINNER

Depending on your age and predicament, you might have been either happy or worried when your mom joined the world of social media. Whether you're ecstatic to share little Burt's tenth portrait of the day or you find yourself frantically deleting evidence of that party you went to, your mom – and maybe even your grandma – are there to stay. Social media is now the norm and the whole world is on it.

Yet social media has even more surprises for us: it's crossing the species boundary. No, not just pets, but predators too: Sharks living off the coast of Western Australia have just joined Twitter.

"Surf Life Saving WA" is a Twitter account that aims to protect beachgoers and has amassed over 31,000 followers so far. The 'tweets' include summaries of first aid assists, pictures of brave rescues on the water, and tweets from the local sharks:

*"Fisheries advise: tagged Tiger shark detected at Warnbro Sound receiver at 06:14:00 PM on 13-Feb-2014"*

Yes, you read that right: sharks that tweet. According to **their website**, the Department

of Fisheries in Western Australia has tagged 326 sharks – including Great Whites, Whaler and Tiger Sharks – with acoustic transmitters. When a tag is then detected by one of the 320 or so acoustic receivers in the water, a tweet is sent out.



ABOVE:  
Researchers  
tagging a  
shark.

This program was set up in response to the high number of fatal shark attacks in Western Australia in recent years, including six in the past two years alone. But Dr. Rory McAuley, principal research scientist with the Department of Fisheries, says that the tagging program isn't just to help beachgoers stay safe: it also contributes to important shark research.

So far, the tag-to-tweet program has done a great job of alerting people to nearby sharks. The one obvious snag, however, is that not

all sharks are tagged. Sharks can swim vast distances: one tagged Great White named "Nicole" **traveled an amazing 20,000 km** from Africa to Australia in 2005. It's likely that many sharks in the waters of Western Australia are only temporary visitors, making it all but impossible to tag every one. But it's a good start, and shark-sympathisers much prefer it to the recent government culling program, which set out to kill any sharks over 3 meters long. According to the website SupportOurSharks.com, over 100 shark experts and 33,000 others have spoken out against the culling. (You can see their letter **here**.)

As a top predator, sharks are 'keystone species' – they have a very important effect on the community around them. If, for example, sharks weren't there to eat sea turtles and

dugongs, their populations would increase; all those extra hungry mouths to feed would lead to an over-grazing of sea grass. (Of course, this example assumes these populations would experience no human interference – something of a vain hope given that both sea turtles and dugongs are **classified** as 'vulnerable' at best and 'critically endangered' at worst.) As sea grass provides habitat and food for many species, losing it would have far-reaching effects. In this way, and in countless others, sharks are vital to the health of the oceans. Sharks help to keep the system in balance.

Ultimately, this shark tagging programme may help establish a healthy balance between sharks and surfers. But in the meantime, don't forget to check your Twitter feed because at least some of them will tweet a hello when they're around.

### Find out more:

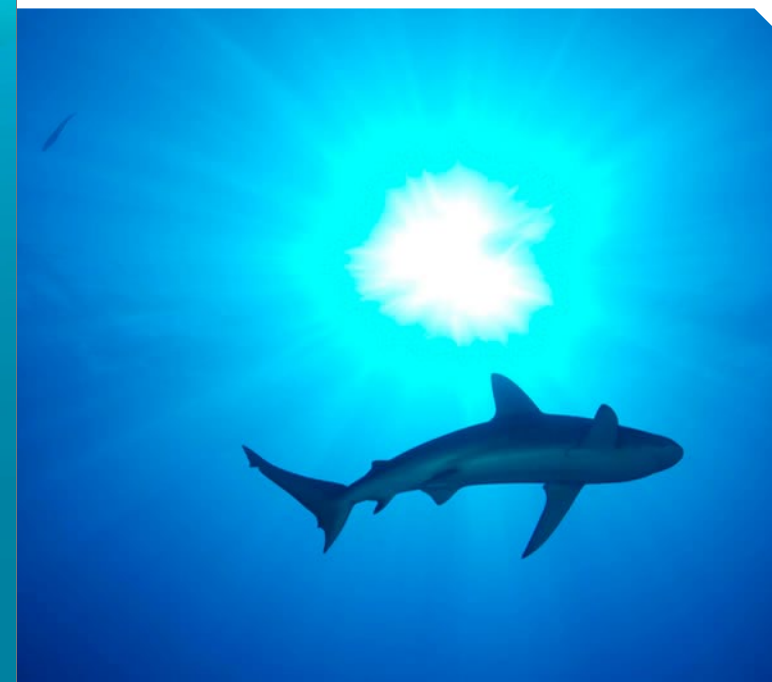
- **The International Union for Conservation of Nature and Natural Resources Red List**
- **Carcharodon carcharias (Great White Shark)**
- **Galeocerdo cuvier (Tiger Shark)**
- **Carcharhinus amblyrhynchos, Blacktail reef shark**
- **Transoceanic Migration, Spatial Dynamics, and Population Linkages of White Sharks**

ABOVE:  
An acoustic  
transmitter,  
used to track  
the shark's  
movements.

## Sharks vs Humans

A headline on the National Oceanic and Atmospheric Administration's (NOAA) **website** reads, "In general, sharks do not eat humans." Rather, the sharks confuse humans for tasty seal or marine mammal flesh. "In general" is somewhat comforting – but perhaps less so when a fin pops up out of the water nearby...

The stats do support the statement. According to the Department of Ichthyology at the **Florida Museum of Natural History**, there were 80 unprovoked shark attacks across the world in 2012, seven of which were fatal. I suppose some may think it's only fair play that we strike back, although we are a bit too effective: we kill 20 to 30 million of them a year.









# ANGELINA JOLIE WAS JUST THE START

THE DOCS WHO WILL KNOW THE FUTURE



JANSKE NEL

## ANGELINA JOLIE WAS JUST THE START

Your mind and body are numbed by the news. Plunged into a confused fog, you struggle to think, feel, or even move. You know that there is talking but you the words lack meaning: your mind is trying to adjust to a new world wherein your body, a perfectly healthy specimen a few seconds ago, now has cancer. Picking out the words, "... in **Stage IV**. Your options are limited...", your attention is drawn inwards once more as, hands trembling, you think only of two words: "Too late".

Being told that you have cancer is something everyone dreads. Everyone reacts to the news differently and sadly, one in three of us will be faced with such a diagnosis at some point in our lives. But what if this weren't the case? Instead of it being "too late", what if your doctor was able to advise you on the perfect treatment to prevent the disease you would have been 'destined' to develop? In the future, predictive personalised medicine could mean that you need never have that terrible consultation.

### Needles and haystacks

**Predictive medicine** (PM) brings together the study of our DNA, proteins and cells to try to weigh up the chances that an individual may develop a certain disease – cancer, say. Doctors use this information to help pinpoint the best therapy for that particular individual, or the treatment that might prevent the disease occurring altogether. At the heart of PM lie

complex computer programs that analyse the details of a person's genetic sequence. As we continue to understand our biology better, so PM will become an incredibly powerful tool of the future.

Predictive medicine has emerged from two immense, collaborative endeavours called the **Human Genome Project** and the **International HapMap Project**. The Human Genome Project ran from 1990 to 2003, combined the efforts of six countries, and had one outrageously ambitious aim: to work out the order of every single 'letter' (called a nucleotide) in a human being's DNA. And this was no mean feat, given that the human genome is written out in a sequence of 2.85 billion letters. (A **printed version** can be found at the Wellcome Collection in London.)

In many ways, the International HapMap Project picked up where the Human Genome Project left off. While the Human Genome Project recorded the DNA sequence of a 'typical' person, the HapMap project tries to work out the DNA differences between people. The mission is then to tie the most common DNA differences to the likelihood of an individual developing a certain disease. But it's a scientist's equivalent of finding a needle in a haystack: 99.9% of the 'letters' in the genome are exactly the same for everyone. It's the remaining one in a thousand letters that makes me different from you – and a change in just a single 'letter' in our genome is enough to have dramatic effects on a person's body. For example, the inherited disease **cystic fibrosis** occurs when there is a change (a 'mutation') in a single gene called the CFTR gene.





## The diseases predictive and personalised medicine will send into the past

Personalised medicine is still a work in progress. As we learn more about how genes and cells work together, personalised medicine will be shaped and fine-tuned so that it can be used by all doctors. Eventually each person's illness should be treatable on an individual level. Even now, though, genetic tests can be used to predict and treat several conditions and situations:

The **screening of newborn infants** is one of the most important areas of current genetic testing. It is possible to test newborns for fatal genetic diseases such as **phenylketonuria** and **congenital hypothyroidism**; the fetus or embryo can even be tested before it is born.

Risk screening for cancer (as in the case of Angelia Jolie) is fairly commonplace as is testing to see whether parents-to-be are carriers of a genetic disease. If a genetic condition (such as spinal muscular atrophy, cystic fibrosis and Fragile X Syndrome) runs in a family then carrier testing can let couples know whether their children would be at risk of having the disease.

Personalised medicine has a long history of use

in treating various **cancers** (including breast, ovarian, prostate, lung, colon, etc); a genetic test of the cancer can guide doctors towards the best course of action to take. Increasingly, doctors can use genetic information to determine **how well certain drugs** will work in an individual – an example being the use of **warfarin** as a 'blood thinning' drug: if the genes *CYP2C9* and *VKORC1* are detected in the person's genome then the drug will be ineffective. Various other drugs have been screened in this way, including Trastuzumab (for breast cancer), **cetuximab** (for colorectal, head and neck cancer) and **gefitinib** (for lung cancer).

Areas of predictive and personalised medicine being researched right now include HIV detection, **cardiovascular diseases** and, most interestingly, neurological diseases such as **Alzheimer's, Parkinson's, HIV-induced dementia, multiple sclerosis** and **schizophrenia**.

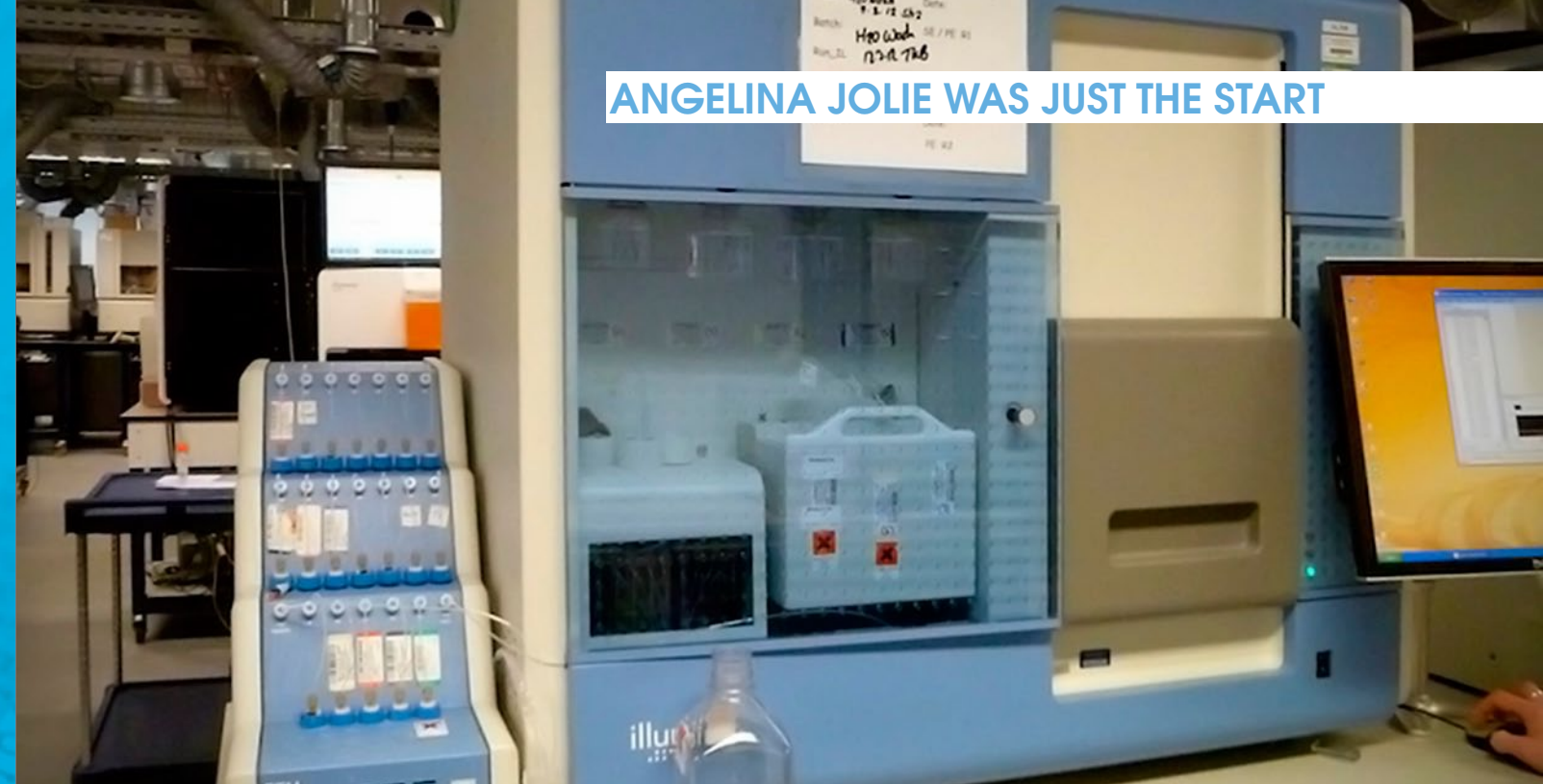
### A personal prediction with a drop of blood

Testing people *before* they suffer a disease will give predictive medicine its true power. When the HapMap Project has found out more about how tiny genetic changes can upset the delicate equilibrium of the body, these 'faults' can be detected in our DNA before they cause any symptoms. And action can be taken as a result, like **Angelina Jolie** did. After undergoing genetic testing, she was found to have changes in her **BRCA1 gene** that are known to increase the chances of developing breast and ovarian cancer. Based on her personalised 87% risk of getting breast cancer, she chose to protect herself by having a double mastectomy.

It goes beyond simple surgery: predictive medicine will mean that the treatment of

disorders can be fine-tuned. Traditional approaches to medicine essentially treat all patients equally; treatments are based on symptoms, medical and family history, and assume all patients will respond to the same treatment in a similar way. Personalised medicine does away with the notion of 'one size fits all'. Instead, the decisions, options and management of the disease is custom-made according to the patient's specific genetic specifications.

The revolution in medicine has already started. For example, the breast cancer drug Trastuzumab (also known as Herceptin) is used to treat breast cancer – but only in women found to have an 'over-active' form of a gene called HER2. If the individual has a normally functioning gene then Herceptin won't work and another treatment strategy would be chosen instead.



ABOVE:  
An Illumina  
Genome Analyzer  
II sequencing  
machine.

### Book an appointment at the Biobank

The reality is that PM is still in the early phases of development. At the centre of this new era in medicine are biobanks, computerised libraries that store data on genome sequences from the world over. They hold the key to each combination of genetic cause and best treatment strategy. But it takes a lot of time to turn information into successful treatment strategies. And there is also the small issue of cost... Although the recently released **HiSeq X Ten Sequencer** can process the genomes of 16 people in 3 days for **US \$1000**, this is still too expensive for most people to get a genetic 'check-up'.

And then there are the moral implications. Such dramatic advancements in science invariably invite controversy. If your entire genome is sequenced from your day of birth, who owns that information, and who should be allowed access to it? Medical aids? Insurance companies? Employers? Could you be hired or fired based on predictions based on your genes? If, for example, it is known that you have an increased risk of developing a debilitating genetic disease, could you be deemed "unfit" for your dream job ...simply because of a single mislaid genetic letter?

The exact ethical dilemmas we will soon face are still an unknown – but what PM promises is not. Angelina Jolie's example is not the first, nor the last, of someone taking precautionary and life-saving steps based on their genes: many have already done the same. But with genetic sequencing becoming cheaper and more reliable every year, and as the HapMap Project reveals more insights, many more of us will be able to live past the numbing shock of cancer. Or never face it at all.

### References:

- **Systems Biology and New Technologies Enable Predictive and Preventative Medicine**
- **Cancer genomics: from discovery science to personalized medicine**
- **Nanopore sequencing**
- **The Human Genome Project 10 year anniversary**
- **The possible ethical implications for DNA sequencing as shown by the movie GATTACA**



**Janske Nel** is currently busy with her second year of a Master's in Nanotechnology, centred specifically on nano-oncology, at the University of the Western Cape, South Africa. She shows no fear in the face of spiders, snakes or long hours in the laboratory, but shudders at the thought of books left face down.



## YOU'RE WEARING WHAT!?

It seems that Apple are running out of ideas. Loved for their ability to charm the masses with beautiful and innovative technology, their iconic smartphone is starting to look decidedly less exciting with each new version that appears. A bigger screen? Yes. A better camera and remodelled case? Well, that goes without saying. A new fingerprint scanner and 'ask-me-everything' Siri? They're really only fun for about five minutes. Put simply: smartphone creativity has plateaued. Developers know that it is time to diversify.

Where next, then, for the pioneering Steve Jobs-wannabes of this world? Looking laterally, most pundits think that the next frontier in 'smart' technology is in what we wear: watches you can talk to, glasses that can guide you, and underwear that **tells you** when you've eaten too many doughnuts.

And while some of this wearable tech promises to be pretty neat, most of it sounds plain nuts. Here are four examples of wearable technologies that are worth watching out for. Expect to see them adorning a body near you very soon...

# Google Glass

Always on the lookout to make our lives just that little bit more sci-fi – what with their self-driving cars, space rockets and office sleep pods – Google are now trying to make the internet just that bit more accessible – by sticking it on the end of our nose.

Heralded by techies as something we'll all want, Google Glass is a pair of spectacles for people who don't actually need them – a cunning bit of kit that projects a digital overlay onto everything you see. Originally designed by people with the all the fashion sense of a fourteen year old boy, they look decidedly man-geek – although slightly less so after a recent high-profile **redesign**.

But it's not just the image that needs work; it's their functionality.

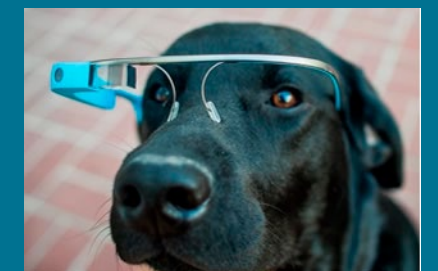
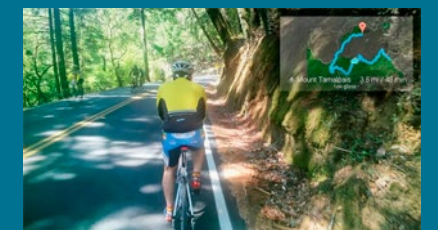
If you can't think of why you'd want a pair, then don't worry – neither can Google. They're still trying to come up with desirable uses for these digi-specs. Let's be honest, the prospect of social media updates, GPS directions and weather reports popping up in your visual field aren't the sorts of things that get the heart racing. And the in-built eye-level camera and video recording facility may feel a little voyeuristic to some.

At the moment, it seems that Google Glass is one of those initially pointless creations that will ultimately end up becoming quite useful. After all, who'd have thought just a few years ago that a third of us would be owning big, flat, touchscreen smartphones that you can't fit in your pocket\*?

## Summary: Isn't the world better without Facebook in your face?

**'Can't wait for it' rating:** 2.5/5

## GLASS



\*Also known as tablet computers



## Smartwatches

It wasn't so very long ago that people were claiming that time was up for the wristwatch. A survey in 2011 **showed that** the majority of 16–34 year olds no longer used watches and were instead using their smartphones to tell the time. But the times could be changing again: the 400 year-old creation is set to make a comeback, thanks to smartphone developers looking to inject life into their stagnating brands.

The idea is pretty straightforward: squeeze the functionality of a smartphone into a watch, à la Captain Kirk's wrist communicator from *Star Trek*. Yet, despite its hype, Samsung's first smartwatch, the Galaxy Gear, was a rip-roaring failure. Ugly, bulky, and with pitiful battery life, it was so awful that **nearly a third** of people who bought one took it straight back to the store.

Fundamentally, however,

smartwatches aren't a terrible idea. Aside from the time-saving feature of not having to reach into your pocket to read your text messages, an internet-enabled wristwatch could actually be pretty useful. For example, a smartwatch could let you check the weather report, glance at your calendar or check social media updates.

Without doubt, the real beauty of a watch is its simplicity: all a wristwatch does is tell the time. And that's something the developers need to get right: a simple but useful watch. No-one uses digital calculator wristwatches anymore because people never really needed the calculator anyway. Thankfully, future smartwatches look set to do a better job than the Galaxy Gear: both **Pebble** and **Qualcomm** have released devices that are simple, fairly attractive... and are good at telling the time.

**Summary:** Probably pretty useful providing they don't have too many bells and whistles.

**'Can't wait for it' rating:** 4/5



## Go faster socks and bra

The fastest growing wearable technology segment at the moment is the personal health and fitness niche. From a developer's viewpoint, fitness gear is a fairly safe bet: components are relatively cheap and there is an established market of people who like to buy digital pedometers and pulse rate watches.

The newer, 'smarter' generation of sports clothing showcases new ways of fusing tried and tested technology into it. Take AiQ's **smart fitness shirts**, for example. These shirts are woven with super-thin stainless steel fibres and embedded with electrodes for recording heart rate, and will soon be able to monitor stress levels, fat content and muscle strength in real time. Meanwhile, Vivobarefoot have released a **smart sock** that analyses foot pressure and force, pace and stride length as you walk or run – feeding all the data to a smartphone for analysis. Microsoft have even patented a bra that takes an ECG heart trace while out and about.

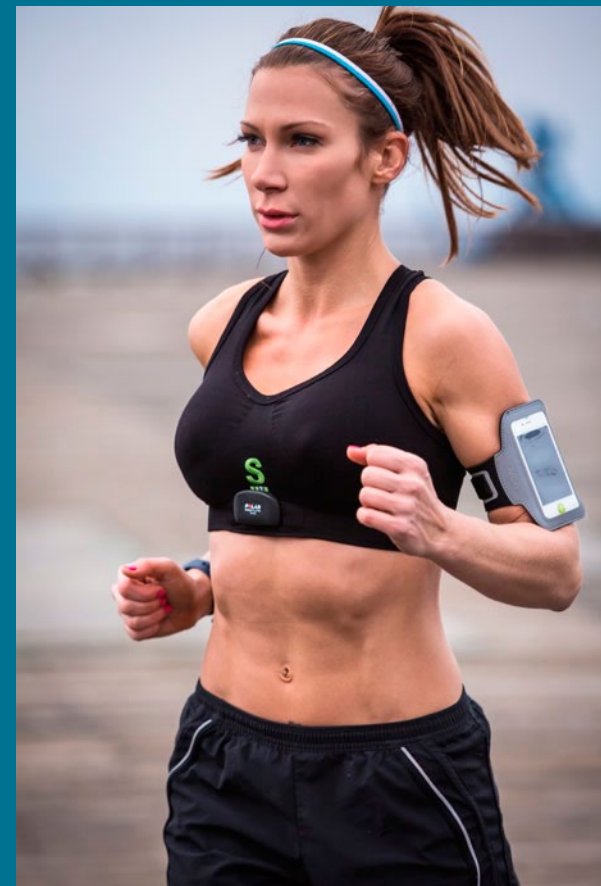
Perhaps the best thing about all this new fitness gear is that it is all machine washable, so you needn't feel guilty about getting sweaty in it.

### Summary:

Great for the hardcore fitness types.

### 'Can't wait for it' rating:

5/5 if you're a fitness fan,  
1/5 for everyone else.





**Smart fashion wear**

In a refreshing departure from all this man-centric wearable technology comes a new wave of 'smart' fashion wear and jewellery that actually has a bit of style.

**Sensoree** have recently unveiled a decidedly futuristic 'mood sweater' that promises to deliver "exitmacy" (meaning "externalised intimacy"). The sweater's collar is embedded with LED lights that illuminate in a variety of colours according to the wearer's excitement levels. Hand sensors detect emotional state by monitoring skin sweatiness so that the wearer's feelings are projected for the whole world to see (see sidebox). Designer Kristin Neidlinge says that the sweater's illuminated collar "replaces speaking, [by making] the wearer's truths instantly expressed with colour". It has the makings of fun on a night

out, but you definitely won't want to be wearing it to work.

Finally, no 21<sup>st</sup> Century outfit would be complete without accessories. '**Beauty Tech**', a fledgling brand set up by computer science student Katia Vega, offers just that. She is creating 'conductive' make-up and false fingernails that have miniaturised electromagnetic components embedded within them. The plan is that divas will be able to click a finger or wink to turn on a light, or buy their groceries with a waggle of their thumb.

And for the more conservative dresser, there's '**Ring**', a Bluetooth-enabled metal ring that lets you operate all your electronic equipment – and even make shopping payments – with finger gestures.

**Summary:** And with a click of a finger I can make the rabbit disappear.

**'Can't wait for it' rating:** 3/5

**Your emotions in colours**

Calm

Tranquil, Zen

Calm, Relaxed

Ruffled, Aroused, Excited

Nervous, In Love

Nirvana, Estatic, Blissful  
Excited

Dr **Stuart Farrimond** (Doctor Stu) originally trained as a medical doctor before deciding to branch out into lecturing. He drinks too much coffee, eats ice cream and has a bizarre love of keeping fit. You can check out Doctor Stu's blog at [realdoctorstu.com](http://realdoctorstu.com).

# "WHAT'S THE TIME, MR WOLF?"

"SORRY BOYS AND GIRLS, BUT I'M NOT WEARING A WATCH"





## “WHAT’S THE TIME, MR WOLF?”

What is the time? It’s an interesting question. Toddlers struggle with it, latecomers avoid it, and the wealthy throw their money on jeweled accessories to answer it. Whatever the case, we all tend to agree: to *know* the time, we need to *check* the time. But it turns out this isn’t quite true. We each have an internal clock that guides our biology according to a daily schedule. So, while Mr. Wolf may not be able to answer the question, it turns out his body already has. Problems arise, however, when the clock fails...

When I say internal clock, I’m not referring to the toy watch you found in your Christmas stocking one year and then subsequently swallowed in all the excitement (though I concede, that too qualifies as an internal clock). Rather, I’m talking about the ability for individual cells to keep time. Just as a typical watch synchronizes it’s ticking to the vibrations of a quartz crystal, so your cells regulate themselves using fluctuations in the levels of specific ‘clock’ proteins. It’s a miniature molecular cascade that lasts roughly 24 hours, and at the end of it all, another day is done – hence why we call it ‘circadian’, from the Latin, *circa* (about) and *diem* (a day).

### Nature’s dodgy clock

Now as a budding young biologist, I’m a firm believer in the wisdom of Nature. But on this occasion, I’m afraid our circadian clock can’t quite contend with the likes of Rolex or Breitling. The fact is, we’re a little slow. Fortunately, our clocks are constantly re-calibrated by environmental cues – most notably, that helio-centric horologist we call the ‘Sun’. And it’s all thanks to some intricate inner workings that would rival the finest Swiss timepiece.

The main circadian regulator in humans is made up of around 1000 nerve cells and is located just behind our eyes in a part of the brain called the ‘Supra Chiasmatic Nucleus’ (taken straight from Webster’s collection of snappy names). Every morning, sunlight enters our eyes and resets the clock – thanks to the breakdown of a rather amicably named clock protein, ‘TIM’. In this way, dawn marks the beginning of a 24-hour cycle in which we wake, eat, work, eat, surf the Internet for pictures of cats, eat, and

finally sleep. Or at least that’s how things were supposed to work before Thomas Edison had the bright idea of trapping light inside a glass bulb. Now our clocks rarely get a proper daily reset.



In today’s world, we are constantly bathed in the glow of artificial light. We are never far from the glare of a computer screen, the hum of a halogen lamp, or the blinking of a thousand LED eyes on the various appliances that populate our homes. Aside from being a nuisance – I’ve long since given up on trying to see the stars through a thick layer of light pollution – this luminescent onslaught also affects our circadian clock.



What time is it? Our bodies are becoming less sure of the answer. And this uncertainty brings some pretty dire consequences. Sleep disorders are common, but more frightening is that circadian disruption can lead to cancer, diabetes, and a myriad of mental health problems. (Quick! Someone get me a Rolex! No? Fine, an egg timer will do!)

Thankfully, just 135 years post-Edison, we are now clocking on to the importance of circadian well-being. The human eye contains around 100 million light-detecting cells, most of which are necessary for vision. However, a small subgroup is used to relay information to our circadian clock about the light around us. Interestingly, these cells happen to be particularly sensitive to blue light. So, by stopping artificial sources of blue light from getting into the eye, the idea is that we could pull an all-nighter at the computer

## “WHAT’S THE TIME, MR WOLF?”

without confusing our circadian clock. (It’s as if the clock can only ‘see’ in blue, and so by filtering out this colour, we trick it into thinking it’s actually dark – when we’re really just staying up past our bedtime).

It’s hard to believe our brain might be that gullible; indeed, the reality is likely to be a bit more complicated. But this idea of filtering out blue light seems to be doing the trick: in clinical tests, special blue light-blocking goggles worn three hours before bed were shown to improve mood and sleep quality. While the same effect has yet to be seen for the other, more sinister symptoms of circadian disturbance, it’s a promising start. And the U.S. military seems convinced, even if you’re not. The Department of Defense are already prototyping their own circadian goggles in the hopes of crafting stronger, faster soldiers.

Now to a guy like me, a pair of socially acceptable RoboCop-esque goggles sounds like a dream come true. But I appreciate this may not be the case for the more conservative circadian health enthusiast. A simpler approach would therefore be to outsource the job to your laptop or smartphone; software is already available that can alter the brightness and colour of an electronic display to better match the type of light we should be experiencing for the time of day. How do I know? Well, it’s 11 o’clock in the evening, and I’m typing these words in the warmth of a deep orange computer screen. (Though I am still feeling a little sleepy.... Perhaps another coffee?)

A bit late in the day, perhaps, but 2014 looks set to usher in a heightened awareness of the importance of a healthy biological schedule. It might not be all that long before we look back on our current lifestyle with the same sense of “well, duh!” that we give to asbestos in classrooms and makeup products containing lead. Whatever the case, perhaps we might offer a bit more thought to a question we hear daily.

What is the time? You should already know.

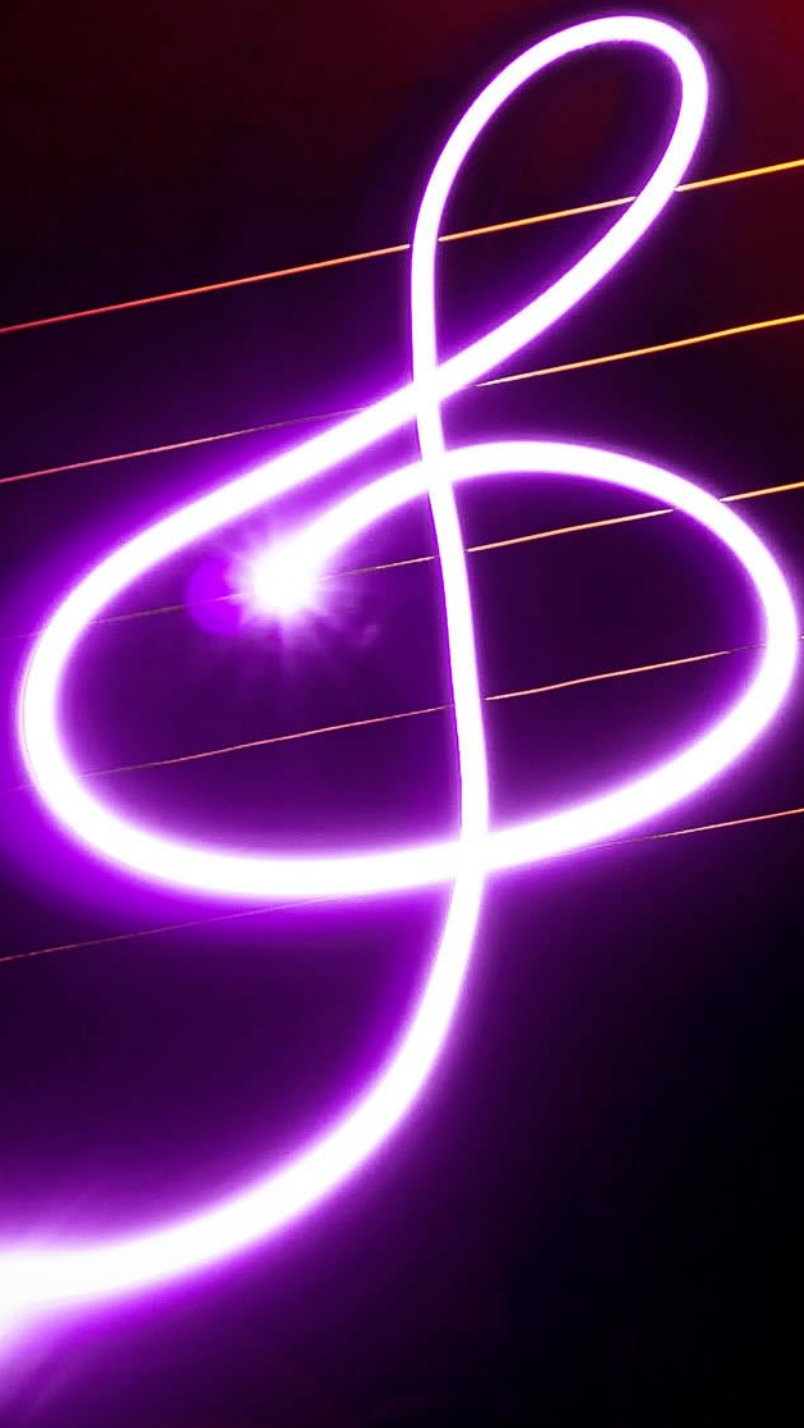


A biologist straight out of Cambridge University, **Ross Harper** spent two years heading his own technology start-ups: **BuyMyFace.com** and **Wriggle Ltd.** As he begins his neuroscience PhD at UCL, Ross is living proof that you can take the boy out of the lab, but not the other way around. Between devising his latest crazy schemes, Ross makes an effort to eat (pizza), sleep (two pillows), and exercise (skiing/rugby/swimming). Follow him on Twitter **@refharper**.



# 5 WAYS TO MAKE FUNKY TUNES

TAKING ELECTRO MUSIC TO A WHOLE NEW LEVEL



KYLE PASTOR

## 5 WAYS TO MAKE FUNKY TUNES

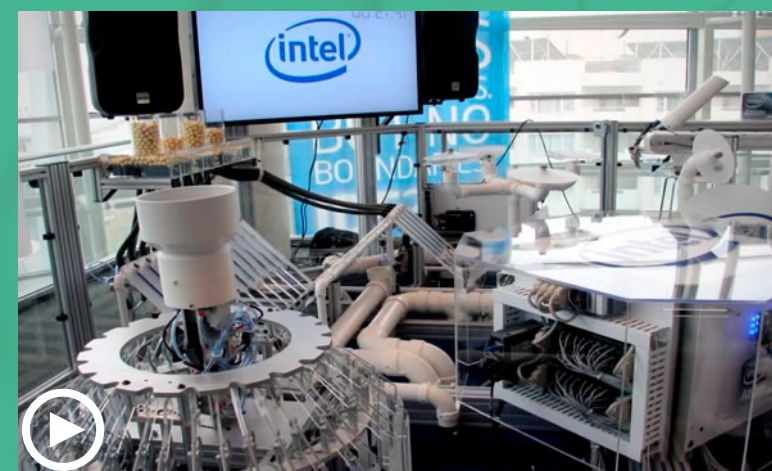
The world is brought to life with the sound of music: the strum of a guitar, the pluck of a violin and the soft hammering of piano strings. But music is not just about traditional musical instruments; the digital age has given a few brilliant individuals the opportunity to breathe life into yesteryear's technology by turning it into something that will get your groove on. Here's our rundown of five of the best:

You can watch the full rundown on our **YouTube Playlist**.

### 5. House of the Rising Sun played by the Tesla Coil Conductors

Tesla coils are doughnut-shaped electrical transformers that produce huge voltages. They are known for their ability to produce exciting electrical displays; the voltage from a Tesla coil gets so high that it actually breaks down the air molecules around it, letting electricity pass through air like lightning.

In this video, a Tesla coil is tuned to play 'House of the Rising Sun' by the Animals. The large sparks you see are actually lots of small sparks that are being produced very quickly. By altering how fast the coil generates sparks, you can create musical tones. It's truly an inspired use of technology... just don't get too close.



### 4. Intel Orchestra performed in the key of 'puff'

What do you get when you mix paintball guns, musical instruments and the super-brains at Intel? Something I like to call the 'pft pft' machine. The system in the video uses computation, real time input, and timed choreography to produce the lovely music you hear... if you can get past the 'pft-ing'.



### 3. Floppy Love

It's just a box, 13 floppy drives, one hard drive, a few bits of computer kit and some lines of code. (Kids, ask your parents what a floppy drive is.) The guy who put it together actually lets you download the code [here](#). If you are feeling especially adventurous, you can even try to build one of your own. The love may be tainted but my wonderment has never been purer.



### 2. MS-DOS dance

If you are old enough to remember the good ol' black and white MS-DOS days, then you may remember hearing the name 'Soundblaster' by Creative Labs. (It was an audio card for old school computers.) Some computer boffins with too much time on their hands have rekindled their 'soundblaster' love and coded a program called **Adlib Tracker II** that turns your dust-covered 1990's computer into a nightclub-worthy music machine. Crank up the speakers to appreciate just how retro-cool it is.

### 1. "Hey Mr Scan-Bourine Man, Play a Song For Me"

This is perhaps the best example of how to make music out of antiquated computer hardware. It's a groovy little number that has hard drives keeping the beat, some tone-generating components for tune and an HP Scanjet 3C scanner for the vocals (naturally). Quaint, soothing and downright geeky, this remix of Fun's 'We are Young' deserves to be on the iPod of any self-respecting computer geek.



**Kyle Pastor** is in graduate school completing a Masters in theoretical polymer physics. When not exploring the physics of stuff nobody cares about, he is usually writing, coding, or playing obscure games that nobody cares about. He blogs about all things interesting at [www.infplus.com](http://www.infplus.com).



## SOLOMON TABLE – DECISION MAKER

**Developer:** Ondrej Mikula

**Price:** Available on iTunes

£2.99 (GBP), \$4.99 (USD)

Some decisions can be tough. But one new app claims to make those tricky choices more straightforward. Without even a hint of irony, here are two reviews from our contributors to help you decide whether it's any good or not.

### Solomon Table: Useful and versatile

On its surface, Solomon Table is a tool designed for indecisive shoppers or those given to impulsive or emotional decision-making. Being neither of these, I found this app to be something altogether more useful.

You are offered up to 21 'slots' for what the app calls 'projects' ('dilemmas' to you or me). Each project allows for five potential choices ('options') across the top of the screen. You then use multiple spaces down the side to plug in 'parameters' that describe the choice you are trying to make – things like cost, location, and size of a house you are looking to buy; or the amount of care needed, allergy considerations, and size restrictions on the type of pet you want to bring home.

Sliding scales inside the table easily let you rate how each option measures up. Maybe the luxury condo gets a +5 for size but a -3 for cost, while the loft apartment scores high for location, but has lower scores for the outdated appliances and threadbare carpet.



It would be ridiculously simple if it stopped there. But beneath each parameter is a second sliding scale that you adjust to reflect how important each parameter is to you, and how heavily it should be considered during the comparison process. So, if furnishings are particularly important to you in your dream house then you can crank this parameter up. As you adjust your preferences, the decision rankings may change. This feature is the biggest selling point of Solomon Table: you tell it how you feel, and it tells you what would be the best fit for your needs.

The app has a lot of potential, and with a few tweaks could be indispensable. The opening screen showing 21 projects is overly busy and the 'recommend app' and 'write us' buttons on the opening menu did not work for me.

Overall, using the app was easy and mostly





## SOLOMON TABLE – DECISION MAKER

intuitive, and I found the instructional screen helpful if any part of the rating process was unclear. Aesthetically, the app did not appeal to me, but it was not entirely unattractive. I was able to create a fantastic rating system comparing several townhouses against my current apartment, and the Table returned results that were both interesting and helpful.

Previously I used a similar 'Pros and Cons' spreadsheet for analysing important decisions, but Solomon Table trumps the spreadsheet by allowing you to view and modify all options side by side on one screen. I even used Solomon Table to compare Solomon Table to my old Pros

and Cons spreadsheet. (Solomon Table won!) That said, the \$4.99 price tag is a bit steep when basic spreadsheet software is relatively ubiquitous.

I would use this app again in the future, and recommend it to my friends who needed help with a tough choice in their life. I suspect it could be very helpful to a wide range of people including couples, families, and roommates trying to come to a mutually agreeable solution on anything from where to live, where to go on vacation, or what to eat for dinner.

**Rating:** ●●●



Nature-lover **Katie Lynn Zeleski** has worked in the biomedical sciences in both the public and private sectors since her graduation from The George Washington University in 2007 and began contributing to Guru in 2012. An avid reader and baker, she is still recovering from an epic 3,000 mile road trip from Washington, DC to Seattle, Washington, camping across the country to settle in her new home.

### Solomon Table: Complicated and useless

The decisions we make play a major role in our lives. What college should I go to: Smith or Skidmore? Even small can ones add up: Should I stay in or go out for a drink? Most of these decisions don't require a lot of thought. But there are times when you simply have to whip out a notepad and make a good ol' pro and con list. Fortunately, I've never had deal with anything that the trusty pen and paper couldn't help me through.

Solomon Table is an app that bills itself as a way to make a sensible verdict on major life decisions. It's an intriguing idea and would definitely save me from the late night calls from friends who desperately need to talk through various "what should I do?" scenarios. However, my intrigue was short-lived.

Solomon Table uses a complicated-looking interface: a "table" is covered with a lot of numbers representing values and percentages. It's not immediately obvious what to do, so my next instinct was to find a tutorial or examples

that the app might have included; they were not helpful. With a little bit of tinkering, I did eventually figure it out. On the top of the table, you have your "options" (e.g. 'Sports car', 'SUV', 'Cadillac', etc). Running down the left column you have "parameters" ('cost', 'speed', 'luggage capacity', etc.) and then there are scroll bars that let you give each option's parameters a score of -10 to 10. Based on the overall average of the score of the parameters, you are given the best or worst choice.

The concept of the app is not very complex. It's as if you made several pro and con lists, gave each pro and con a value from -10 to 10, and averaged the numbers out. It could be useful in principle, but there are very few decisions in life for which this kind of system is appropriate. The only problem time when I would probably use Solomon Table is when I am deciding which house to buy. Although, to be honest, now that I know the inner-workings of Solomon Table, I would probably just do it with pen and paper.

**Rating:** ●●



**Lucy Huang** has a degree in molecular biology from Skidmore College and was Guru's first official intern in 2013. A New Yorker through and through, she is known for being both an excellent dancer and an expert in the finer points of making a premium cup of tea.



# ASK A GURU ?

Here's our regular roundup of answers to some of your recent questions.

If you've got a question, then **tweet** #AskGuru, **Facebook** us or send us a **message online** every Friday. Our team will endeavour to get you a full, accurate, and (hopefully) witty answer.

## Why is the sunrise red before a storm?

*I am in New Zealand and Cyclone Lusi is approaching – the sunrise is beautiful!*

Asked by @sineira via Twitter

To understand why the sunrise you see before a storm is red, you also need to understand why the sky is blue.

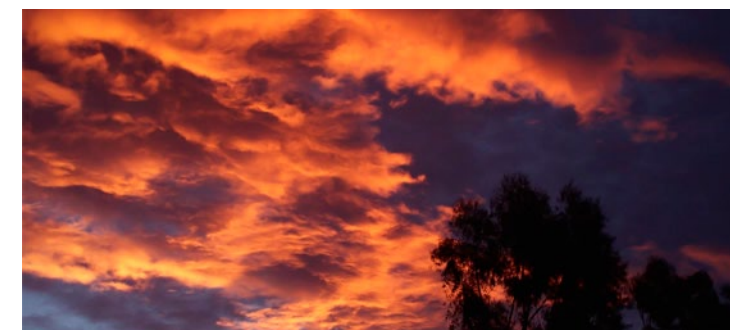
When you look up on a cloudless day (as it is today as I write this), the sky looks like a cool blue dome. This colour is caused by the way sunlight interacts with what is in our atmosphere – mostly nitrogen and oxygen.

Sunlight appears white but is actually made up of a spectrum of colours (all the colours of the rainbow). As sunlight passes through the atmosphere, it strikes the gas molecules and other particles in the air, 'scattering' the light. It is the blue part of the scattered light that gives the sky its blue colour.

However, the thickness of the atmosphere changes its colour. When the sun is low in the sky, as is the case during a sunset or sunrise, the light passes through much more atmosphere before it gets to our eyes. All the blue light has been scattered away by the time it reaches us, leaving only the red and orange light. The reddish colours are made even more striking when the light passes through a high pressure air zone – the high pressure trapping more

dust and small particles in the air, scattering even more of the blue light.

So, why a beautiful sunrise before a storm? The saying "Red sky at morning, shepherd's warning" holds some truth in parts of the world where the prevailing winds are west to east (as they are in Northern Europe, much of USA and New Zealand – see [this interactive map](#)). Generally speaking, weather patterns (such as storms or high pressure systems) will approach from the west in these areas. Therefore, when the sun is rising in New Zealand, the morning light is passing through the weather pattern that has just passed overhead. If this is a high pressure system, then the sunrise will be red. And what follows a strong high pressure weather system can often be a storm.



Answered by Dr Stu





# Do other animals experience pleasurable female orgasms?

Asked by Louise Allan via Facebook

Yes, other species experience pleasurable female orgasms, or at least it appears that way. It is hard, after all, to ask the female chimp after her artificial ‘stimulation’ in the lab how it felt. But the signs are all there – the chimps exhibit most of the same indications of orgasm as women do.

In 1981, a **research paper** in the *American Journal of Primatology* stated that the signs of female orgasm include, “hyperventilation, involuntary muscle tension, arm and leg spasms, [and] grimacing,” among others that were slightly more graphic.

Orgasms aren’t limited to just chimps: a **1998 paper** published in *Animal Behaviour* on the orgasm rate of Japanese macaques mentions that, “under specific circumstances, non-human primate females may experience orgasm.” The primates in general, then, appear to be lucky in this regard. However, they quickly add that the occurrences of female orgasms are highly variable. The social situation seems to be an important factor in whether the females orgasm... at least for Japanese macaques.

## Bisexual monkeys and odd animal fetishes

The gender of the female’s partner, however, may not be as important. In a **1974 paper** entitled (get ready for it), “Male-Female, Female-Female, and Male-Male

sexual behavior in the stumptail monkey, with special attention to the female orgasm,” researchers discovered that females could orgasm regardless of their partner’s sex.

While it may be more difficult to judge if non-primate species are indeed having orgasms, a **1979 paper** in *American Anthropologist* lists many examples of “non-reproductive sexual behavior” in other animals: dogs that aren’t in heat rubbing themselves on “any suitable object”, a cat with “shoe fetishism,” and dolphins that masturbate. (Researchers have more recently graced us with a **video** of dolphin spontaneous ejaculation.) Slightly more alarming, one “male dolphin carried a dead female about for five hours, copulating with her several times.”

Even “Birds feel the rub” as an **article** was titled in *Nature* in 2001. The red-billed buffalo weaver has a “remarkable false phallus,” which is quite unusual for birds as most males don’t have any phallus at all. It seems the penis-like protuberance is meant as a signal of high sperm quality and doesn’t actually enter the female. However, the male rubs it on females and reaches what looks like orgasm: the male bird “shuddered and its eyes glazed over.” So, while it’s still unknown whether orgasm extends to the female red-billed buffalo weaver, it seems that orgasms aren’t just a human trait after all.

Answered by Autumn Sartain



# How can hand sanitizers kill viruses, yet we can’t cure an infection?

Asked by @pstni via Twitter

Technically, hand sanitizers target virions, not viruses. Virions are the form of the virus that exist outside of our body. They have a special protective coat that keeps them healthy in the outer world – a naked virus is very delicate.

When the virion enters the body and uncoats itself (like people take off their coat when entering your house) then it’s known as a virus. After uncoating, the virus no longer conceals its weapons such as its proteins (kind of like knives and guns) and DNA or RNA (sort of like high-tech computer weaponry). Using these weapons, it attacks and takes over cells in the body, holding them hostage until your body’s police force (the immune system) is able to step in and stop it.

What a great houseguest, no?

So, to answer your question: hand sanitizers target the coat of the virion. They cut and shoot holes into the

coat. But if the virus has already invaded your body (your home), these same chemicals aren’t very useful because the virus has already de-robed and made their way inside your cells. Plus, you couldn’t inject a hand sanitizer anyway because today’s sanitizers are made from concentrated alcohol that would kill you if put in the blood.

But think about it. If an intruder is outside your home, it’s very easy to arrest them or shoot them without harming you. But if they have taken you hostage, and are holding you at gunpoint so to speak, it’s much harder to extract yourself from the situation. It’s also very difficult to harm the intruder without you also getting harmed by accident. This is one of the key reasons why so many antiviral medicines taken by mouth are either ineffective or cause many side-effects.

So hand sanitizers can be useful for virus protection but are not designed for hostage crisis situations.

Answered by Artem Cheprasov





# COMMUTING

DOES IT HAVE TO BE A BURDEN?



BEN VEAL ■ MEDIA GURU

## COMMUTING

If the daily grind of getting to work grinds you down, then let Media Guru Ben Veal's decidedly light-hearted look at easing tension in the tailback, give you some relief...

Being a regular rail user, my interest was recently piqued by findings from the UK's Office for National Statistics (ONS) on the topic of commuting. The study of both employees and self-employed people, entitled '*Commuting and Personal Well-being*', analysed how time spent commuting and the method of travel affect life satisfaction. The results were not pretty.

They found that, "holding all else equal, commuters have lower life satisfaction, a lower sense that their daily activities are worthwhile, lower levels of happiness and higher anxiety on average than non-commuters." Ouch. And apparently the situation's even worse for those who spend a large proportion of each working day on the road, with the report stating that people with journey times lasting between 61 and 90 minutes came off worst.

the method of travel used based on a sample of over 60,000 respondents – 91.5% of which were classified as commuters.

However, it wasn't just the study's findings that intrigued me so much as how the media reported it with such negativity. For example, Philippa Roxby, health reporter for *BBC News*, remarked that, "the daily commute to work is something to be put up with rather than enjoyed ... [and] the average worker in Britain spends 54 minutes commuting each day." This isn't really altogether shocking. If anything, I was surprised that the number wasn't higher, given that the UK is slowly dragging itself out of recession and into a very competitive job market. No, what interested me was the idea, supported by this report, that commuting to and from work is a wholly negative activity that simply has to be *endured*. That's certainly not the way I see it.

### Mastering the art of happy commuting

Commuting has been a key part of my working life for many years now. Over the years I've tried virtually every available method of travel available – including walking, driving and cycling – and have found that all have their own distinct disadvantages.

These days, I've settled on catching the train and in recent months have found myself asking whether the daily commute has to be such a bad thing. With so many of us destined to spend countless hours staring at the same stretch of road or faces day-in-day-out, isn't it ultimately up to us to make a change – to master the art of the commute?

For me, this report could not have been published at a better time; it's given me the extra incentive that I needed to overcome the drudgery of the daily commute and seek out the positives instead. As such, I'm currently exploring four simple ways to enjoy my train journey – and if you're one of the many thousands of people that are in the same boat as me, I'd like to invite you to join me in taking control of your journey through the following:

### Broaden your mind

Catching the train every day, I find that it's all too easy to get agitated by delays, train faults and overcrowding (as followers of my Twitter account will no doubt be aware). More recently, though, I have instead seen these minor griev-



For anyone who has ever had to commute to their place of work – and let's face it, at some point or another, that will have been pretty much all of us – the report makes for compelling reading. The study delves deeper into the issue by making detailed comparisons between commuting and non-commuting, the amount of time spent commuting each day, and



## COMMUTING

ances as exactly that – *minor* – and have focused my energy on using this bonus time to work my way through some of the literary classics that I’ve always been meaning to get round to reading. I’ve reached my destination at exactly the same time, but with slightly less worry lines on my face at the end of the journey.



Reading is a tremendous stress reliever, as confirmed by **research** carried out at the University of Sussex. Cognitive neuropsychologist Dr David Lewis explained the calming effects of literature, stating, “By losing yourself in a thoroughly engrossing book you can escape from the worries and stresses of the everyday world and spend a while exploring the domain of the author’s imagination.”

Oh, and of course, if you can’t think of a suitable novel right now, there are now almost **three years’ worth** of *Guru Magazine* also available for free at your digital fingertips(!) Alternatively, if you prefer to listen, or you drive to work each day, audiobooks and **podcasts** are also great ways to explore topics in detail while still focusing on the world around you.

### Don’t be a stranger

Train journeys serve as a great opportunity to meet other people. If anyone should know, it’s me. Almost a decade ago now, I shared polite conversation with a young lady standing next to me in a crowded carriage. We had a great deal in common and six hours later, we were still talking animatedly. Two years after that, we were married. (*Moral of this story: be careful who*

*you speak to! – Ed*)

When you’re doing the same journey every day, it can be easy to stick to your individual routine and not reach out to those around. Face to face communication makes us **happier and healthier** people so it’s worthwhile peering outside of our little zones for opportunities to relate to those around us. You never know what may happen as a result.

Of course, this doesn’t just apply to catching the train. If driving to work is your preferred method of transport, then offering to share your car with a colleague could be a great way to get to know them and to have the kind of deep conversations that just aren’t possible beside the water-cooler.

### Be a nice person

As well as connecting with those around us, there is a **close association** between being kind and our psychological wellbeing. But being a nice person in the midst of the rush hour when every second counts isn’t particularly natural. I’ve given it a go, though, and would wholeheartedly encourage looking for opportunities to perform random acts of kindness. It doesn’t sound like much, but it can be a great boost to find another passenger on the train – an elderly person, for example – who may benefit from the seat instead of me. After all, it’s really no skin off my nose; I’m about to spend the next nine hours sitting on my behind.

Commuting can be a burden – but it doesn’t have to be. In order to make a living and do the job that we want to do, the vast majority of us will have to make that journey each day, regardless of whether we wish to or not. It’s part of our lives and, if you’re an ‘average’ Brit, then you’re likely to spend an average of 13,550 minutes – or 225 hours – doing it each year. In **America and Canada**, it is 105 hours and in **South Africa**, 233 hours. So wherever or however you do it, you might as well take steps to enjoy it.



**Ben Veal** is a Public Relations and Digital Marketing professional based in Wiltshire, UK. A big fan of film and literature, Ben also writes for the Daily Mirror about the rather unusual sport that is professional wrestling. Find out more about Ben at [www.benvealwrites.com](http://www.benvealwrites.com). You can follow him on Twitter [@BenVealPR](https://twitter.com/BenVealPR).

# DEPARTURE LOUNGE

Hi there! I almost didn’t recognize you behind all that tech-bling you’re wearing. You’ve got your Google Glass, smartwatch, and... is that a robotic hand you’re wearing? Nice.

In this issue of *Guru Magazine*, we hope to have given you a taste of just how deeply technology has permeated our culture. Each year brings more weird and wonderful gizmos: some that fall by the wayside and others that become something we just can’t live without.

It all comes down to quality and simplicity, and that’s what we strive for at Guru. We aim to bring you creative and entertaining content from writers all over the globe, and deliver this to you through a snappy little app for your smartphone and tablet. We’re proud of what we’ve done – but we think we can do better! That’s why, for the next few months, all flights are temporarily grounded. We’re taking some time out to streamline the Guru brand and hopefully come back with something even cooler than before.

We’re excited about the future, but this does mean that Chapter One of *Guru* is drawing to a close. Without wishing to get too emotional – *sniff* – we’d just like to thank – *sniff* – everyone who’s helped us get this far – *double sniff*. I’ve said it before and I’ll say it again, if it weren’t for you... well, you know.

So for one last time (in this current incarnation of *Guru*), thanks for stopping by, and we hope to see you again very soon.

Ross.

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